REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
31-MAR-2002	Final	Oct 1998 thru Sep 2003

4. TITLE AND SUBTITLE
Researchers Make Shelters Lighter by Blowing Them Up

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
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5d. PROJECT NUMBER
4918C19D

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Air Force Research Laboratory (MLQD)
139 Barnes Drive, Suite 2
Tyndall AFB FL 32403

8. PERFORMING ORGANIZATION REPORT NUMBER
AFRL-ML-TY-TP-2004-4550

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT

12. DISTRIBUTION/AVAILABILITY STATEMENT
Distribution Umlimited; Approved for Public Release

13. SUPPLEMENTARY NOTES
Article reprint; published in Air Force Research Laboratory Technology Horizons, March 2002, pp: 5, 26-27

14. ABSTRACT

Researchers are testing inflatable textile air beam technology to provide quick, lightweight, and easily constructed alternative to current temporary aircraft shelters. The air beams are made with a lightweight, high-strength fiber outer material and a plastic inner tube, and are inflated to a high air pressure to provide a rigid frame. The shelters feature high strength under applied loads, high stiffness, low weight, and will withstand an overload without damage. Emergency personnel could rapidly deploy and erect these shelters during a natural emergency for temporary use as a command post or medical facility.

15. SUBJECT TERMS
airbeam, high pressure airbeam, air inflatable shelter, seamless airbeam

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
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Researchers Make Shelters Lighter By Blowing Them Up

Researchers are developing a new type of temporary shelter that is significantly lighter, faster to transport, and easier to construct than existing shelters.

AFRL's Materials and Manufacturing Directorate, Air Expeditionary Forces Technologies Division, Deployed Base Systems Branch, Tyndall AFB FL

Scientists at the Materials and Manufacturing Directorate, in conjunction with the Army, are developing inflatable textile air beam technology to provide deployed forces with a quick, lightweight, and easily constructed alternative to current temporary aircraft shelters. Constructing large shelters for use as aircraft hangars, maintenance facilities, and storage warehouses is a major concern for forces deploying to bare-base locations around the world.

Air beam technology emerged from nearly six years of cooperative research and development between the directorate's Deployed Base Systems Branch and the US Army Soldier and Biological Chemical Command. Researchers hope to replace the heavier aluminum structural frame of current shelters with the lightweight air beam (see Figure 1).

Mr. Reza Salavani, AFRL program manager, said he expected the technology to reduce deployment time by 75%, labor hours by 85%, and the number of people required to put up the shelter by nearly half. He also anticipates the shelters to be 60% lighter and require a single shipping container in lieu of three, which will allow more shelters to be shipped per aircraft.

"Many of the current shelters being used are based on old-fashioned pole tent technology," said Salavani. "They take several airmen anywhere from several hours to days to construct. With air beam technology, we can significantly reduce deployment logistics, including the amount of time, people, and aircraft required to set up bare-base operations."

The directorate is currently evaluating two small-sized shelters that have air beams made with a lightweight, high-strength fiber (polyethylenenapthelate and Vectran®) outer material and a plastic inner tube. The beams' high-strength outer material is durable and moldable, and the beams are inflated to a high air pressure to provide the rigid frame (see Figure 2). The beams are covered with a tan or camouflage polyvinylchloride-coated polyester material after inflation.

"The high-performance beams for these shelters feature high strength under applied loads, high stiffness, low weight, and will withstand weight from an overload without damage," said Salavani. "When deployed forces face high winds, snow, or other environmental effects, these shelters will be strong and sturdy enough to keep Air Force troops and assets safe."

The directorate is testing the shelters, made by two manufacturers and differing in several ways, to evaluate their advantages and individual characteristics. The tests will provide useful data on how well the shelters perform over extended periods of time in adverse weather and after being constructed and taken down several times.

Mr. Salavani said the Air Force will choose a manufacturer to design, build, demonstrate, and evaluate a large aircraft shelter in the near future. Researchers expect the shelters to be 72 ft wide, 135 ft long, and 24 ft high. "This will be more than enough space to store an F-15, F-16, or F-22, and all of its support and maintenance equipment," Salavani said (see Figure 3). "We'd eventually like to develop a shelter large enough to house larger aircraft; the idea is conceivable with this technology at our disposal."

Follow-on development efforts will integrate next-generation power utilities and accelerate the transition of all other bare-base shelter support equipment. In addition, both the Air Force and air beam technology manufacturers anticipate technology spin-offs that will be useful to other military services.

The Army plans to use the technology for shelters, but they are also exploring the possibility of using it for breakwater systems, which would provide wave protection behind inflated textiles for ships. "Both the Navy and Marine Corps suggested that, with slight modifications to the polymer used in manufacturing, the technology might be useful as fuel bladders," Salavani said.

"What started as technology for deployable shelters has evolved into several outstanding possibilities," he added. "It is obvious to several branches of the Department of Defense that this is a technology with wide application possibilities."

Mr. Reza Salavani and Mr. Timothy Anderl (Anteon Corporation) of the Air Force Research Laboratory's ***Materials and Manufacturing Directorate*** *wrote this article. For more information contact TECH CONNECT at (800) 203-6451 or place a request at* ***http://www.afrl.af.mil/techconn/index.htm****. Reference document ML-01-07.*

Figure 1. Small lightweight air beam shelter
Figure 2. Inflatable textile air beam frame
Figure 3. Artist conception of a temporary aircraft shelter

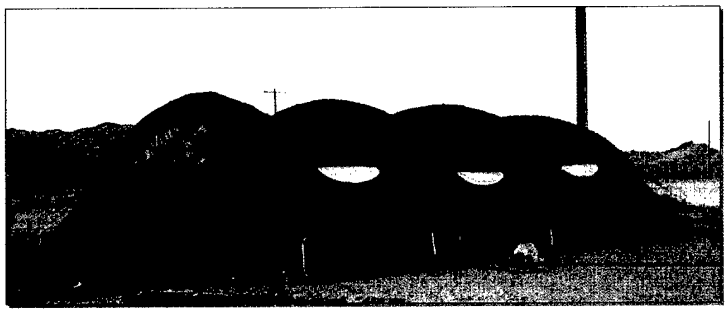

Figure 1. Small lightweight air beam shelter

Figure 2. Inflatable textile air beam frame

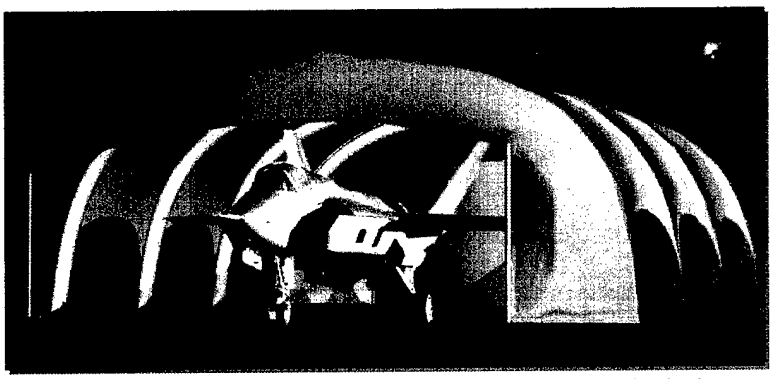
Figure 3. Artist conception of a temporary aircraft shelter